HSR
Historical Social Research

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doi: 10.12759/hsr.47.2022.42

Published in:
Historical Social Research 47 (2022) 4

Cite as:

van der Straeten, Jonas. 2022.
Sustainability's "Other":
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Historical Social Research 47 (4): 139-167. doi: 10.12759/hsr.47.2022.42

Sustainability's "Other": Coming to Terms with the Electric Rickshaw in Bangladesh

Jonas van der Straeten *

Abstract: *»Das ‚Andere' der Nachhaltigkeit: Der Umgang mit der elektrischen Rikscha in Bangladesch«.* The transition from fossil fuel-powered to electric mobility is widely discussed as a trajectory towards more efficient, affordable, and sustainable transport infrastructure. Widely ignored in academia, this transition has occurred earlier, faster, and more profoundly in Bangladesh than in Europe or the US but under conditions almost diametrically opposed. Without any national policy to support it, the transition has been driven by the country's informal economy. However, rather than being framed as a potential technology for "greening" public transport, electric rickshaws are subject to controversies, bans, and exclusion from policies for electric vehicles. This article explores the reasons behind this discrepancy. It unpacks the preconditions, sites, agents, and practices underlying rickshaw electrification in Bangladesh and situates the conflicts surrounding it in a wider institutional context. It shows how in these conflicts, national-level policymakers and business elites mobilize imaginaries of sustainability against electric rickshaws and rely on strategies of "othering" them in (eco-)modernist narratives of social change. Based on the case study, the article points to open questions for the current decolonization agenda in global debates on sustainability transitions and infrastructure.

Keywords: Electric mobility, Bangladesh, sustainability transitions, decolonization.

1. Introduction

In global debates within and beyond academia, the transition from fossil fuel-powered to electric mobility is widely discussed as a trajectory toward more efficient, affordable, and sustainable transport infrastructure. At the same time, the global academic debate on electric mobility remains almost exclusively focused on the Global North, overlooking some countries and areas of

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application where this transition has occurred earlier, faster, and more profoundly than in Europe or North America. In Bangladesh, for example, the electrification of three-wheeled transport already began in the mid-2000s. The current number of electric rickshaws in the country is estimated to be between one and four million (Zami 2022). For comparison, the total number of registered electric cars in Germany was 687,200 in April 2022 (Statista 2022).

Without any national policy to support it, the electric mobility transition in Bangladesh has largely followed the dynamics of the country's informal economy. It is driven by thousands of small-scale importers and manufacturers of electric rickshaws ("garages"), tens of thousands of rickshaw fleet owners ("maliks"), and millions of drivers. Although they have established themselves as a popular – and in many places, prevalent – mode of public transport, electric rickshaws are rarely framed as a potential technology for "greening" public transport infrastructure in public discourse and political narratives. Quite to the contrary, they are portrayed as an epitome of almost everything that the country wants to overcome on its modernization path – the unregulated, informal part of the economy; the congested cities; and the high number of road accidents. Electric rickshaws are officially "street illegal." They are subject to recurrent bans and, remarkably, are excluded from policies that are currently drafted to facilitate electric mobility in the country.

Using the example of the electric rickshaws of Bangladesh, this article explores the manifold conflicting, contradictory, and paradoxical impacts that arise from the incompatibility between grand, technology-centric sustainability narratives and resource- and energy-efficient practices on the ground. It scrutinizes the struggle of different stakeholders to come to terms with the ongoing proliferation of electric rickshaws in the country. "Coming to terms" can be understood not only in a metaphorical but also in a very literal sense. Millions of electric rickshaws in Bangladesh remain incommensurable not only with the legal terms and frameworks needed for their effective governance but also with established systems of meaning that have incorporated concepts such as sustainability, modernity, or infrastructure. This incommensurability is not simply a result of cultural interpretations. Because the production, import, and operation of electric rickshaws are difficult to monopolize, they resist incorporation in a system of governance in which the relationship between business and politics heavily relies on elite-level dealmaking (Raihan and Bourguignon 2020). Electric rickshaws, in their current "unruly" form, face stiff resistance from a coalition of actors within the country's government and business elite. These actors pursue a politics of categorization that entails a deliberate "othering" of electric rickshaws. In the public discourse, imageries of sustainability, which serve as an increasingly strong normative point of reference, are often mobilized *against* the electric rickshaw in its present material configuration.

This article draws on current scholarship on the contested nature of sustainability as a normative concept. As Adloff and Neckel (2019) have pointed out, different imageries of "sustainable futures" imply competing, sometimes mutually exclusive trajectories of social change (see also Degens, Hilbrich, and Lenz 2022, in this volume). Proponents of a "critical sustainabilities" research agenda have highlighted that the negotiation of those trajectories is geographically situated and deeply enmeshed in political economies and ecologies (see, for example, Greenberg 2019). The struggles that oftentimes accompany the negotiation of rival and unequal approaches to sustainability in the Global North are equally pronounced in the Global South. Kumar, Höffken, and Pols (2021), for example, recently highlighted the unintended consequences of an accelerated decarbonization and energy transition agenda regarding justice and inclusivity (see also Symons and Friederich 2022, in this volume). The negotiation of sustainable futures cannot be understood without reference to the social and institutional realities in the Global South, where the forms of governance are typically characterized by informal institutions "that are in constant contestation, negotiation and resistant to formally imposed rules" (Ghosh et al. 2021, 107).

This study therefore addresses the following questions: How to understand and address the power issues that can determine whether sustainability transitions entail social and environmental justice? What role do imaginaries of sustainability play as enablers or barriers of these transitions in Global South contexts? Do those narratives reproduce incumbent practices and structures, or do they imbue different actors with the creativity and the power to conceive alternative, sustainable futures (Adloff and Neckel 2019)?

In addressing these questions, this paper is organized as follows. Chapter two situates the article in a wider scholarly agenda of decolonizing knowledge-making in debates on sustainability transitions, transport geography, (electric) mobility, and urban infrastructure. Chapter three provides an overview of the wider history of three-wheeled transport in Bangladesh. It reconstructs the proliferation of electric rickshaws in the last 15 years and discusses their role within the landscape of (largely informal) public transport. Chapter four explores the reasons behind their commercial success by unpacking the "disruptive" nature of electric propulsion in the context of three-wheeled transport in South Asia. The chapter further reflects on the question of agency in the transition, focusing on the role of rickshaw "garages." Chapter five provides an overview of the societal conflicts and negotiations that the unregulated proliferation has caused and situates them within Bangladesh's wider political economy. Chapter six investigates the narratives of social change that different actors mobilize to forward their respective agenda in these conflicts. It explores the position of specific imaginaries of sustainability in these narratives and unpacks strategies of "othering" rickshaws in these debates.

2. Infrastructure and Sustainability: Unrecognized Sites and Drivers of Sustainability Transitions in the Global South

Recent years have seen various initiatives to decolonize knowledge-making in multiple scholarly debates associated with sustainable infrastructure provision – for example, the debates on sustainability transitions (Ghosh et al. 2021), transport geography (Wood, Kębłowski, and Tuvikene 2020), and urban infrastructure provision in the Global South (Roy 2011; Caprotti et al. 2022; Lemanski 2021). Proponents of the decolonization agenda in all mentioned debates unanimously call to look beyond the ostensibly formal infrastructures. For the respective debates, this shift of focus implies, for example, to acknowledge and scrutinize "everyday struggles" and resistances as the social realities of socio-technical transitions (Ghosh et al. 2021, 107); to devote attention not only to regulated but also to unregulated, under-regulated, and de-regulated forms of transport, all of which can provide mobility solutions that often transcend the binaries of formality and informality (Wood, Kębłowski, and Tuvikene 2020); or to explore how urban dwellers rely on strategies of technological bricolage to access basic services such as water and energy, often relying on a pragmatic mix of networked and non-networked services (e.g., Munro 2020). In the first instance, such studies debunk the deficiency narratives that characterize those spaces that are often framed as "poor" or "informal" exclusively in terms of their "failure" to connect to the formal and networked "modern" infrastructure. They can contribute to a more inclusive, nuanced, and balanced understanding of how infrastructure provision works on the ground in the Global South.

However, the aspirations of the decolonization agenda reach further. Acknowledging that "many Global South countries are in fact ahead of the developed North in ecological resilience, social solidarity, and sustainable living" (Ghosh et al. 2021, 107; Hayward and Roy 2019), studies have highlighted the potential to generate actionable knowledge for the Global North through learning from Global South contexts. Urban scholars, for example, have argued that "off-grid" spaces of cities in the Global South are not only functioning places but also localized sites for developing and promoting sustainability (Azunre et al. 2021; Caprotti et al. 2022). Transport planning researchers call for exploring and tapping the "inherent flexibility, responsiveness and utility of informal transport" (Wood, Kębłowski, and Tuvikene 2020). Such arguments also reflect a shift of perspective in regard to their underlying concepts of infrastructure – away from the large-scale material structures that have long shaped the imageries of infrastructure to the agents and practices associated with "doing infrastructure." Perhaps the most radical expression of this shift is Simone's (2004, 2021) notion of "people as infrastructure."

Despite this empirical shift to hitherto unrecognized or understudied sites, agents, and practices of "doing infrastructure" in the Global South, a key question remains unanswered. How can such practices on the micro level aggregate into transitions on the large scale and consolidate into sustainable futures of infrastructure provision? There is a wide consensus in the debate on sustainability transitions that this process is highly dependent on "transition intermediaries," understood as those actors "that positively influence sustainability transition processes by linking actors and activities, and their related skills and resources" (Kivimaa et al. 2019, 1072). Typical examples are non-governmental organizations (NGOs,) consultants, government-initiated agencies, social enterprises, user clubs, and advocacy groups, as a recent literature review and typology by Kivimaa et al. (2019) suggests. However, the authors also highlight that many intermediary functions are performed by actors unaware of their intermediation role. Craftspeople, architects, or energy advisors, for example, serve as de-facto intermediaries – and gatekeepers – in the diffusion of energy efficiency measures in housing (Zaunbrecher et al. 2021). Wade, Hitchings, and Shipworth (2016) draw attention to installers as "missing middlemen" in the debate on domestic heating and study them as a community of professional practice.

Anthropologists working on the Global South have provided examples of communities of practice that fulfill similar intermediary roles. Beck (2009) conducted a meticulous ethnography of a community of practice concerned with "modding" and operating imported trucks that has profoundly transformed overland transport in Sudan. Lambertz (2021) provides an account of how local entrepreneurs and technicians in Congo have merged imported Chinese diesel engines and artisanal watercraft into a novel form of riverine transport that has considerably democratized connectivity and mobility. The agency of these intermediaries is based on their capacity to appropriate globally circulating technologies, adapt them to local contexts, and establish business and operational models that transcend the boundaries between economic sectors and associated fields of knowledge. The ethnographies show the bold creativity and tacit knowledge at play and offer an in-depth understanding of the social organization of this creativity. At the same time, anthropologies made few attempts to situate these communities of practice within wider socio-technical transitions.

To deliver on its goal to empower bottom-up infrastructural change in the Global South and draw globally applicable lessons from it, the decolonization agenda needs to complement its focus on ontologies with more robust research on practices and intermediaries (see e.g., van der Straeten and Monstadt, forthcoming). This endeavor requires critically revisiting the notion of intermediation as a directed, intentional process, mostly performed by actors that self-recognize as change agents and commit to shared goals of a transition process – in this context, framed as "sustainability." Although these self-

recognized intermediaries are much more visible than unaware ones, especially on the level of discourses, their agency as change agents in the Global South tends to be overestimated, as is illustrated by the case of electric mobility transition in Bangladesh.

This study proposes that a more productive venture point for designing research on sustainability transitions in the Global South is an exploration of the practices of "doing infrastructure" that are resource-efficient, flexible, or resilient but not necessarily framed as "sustainable" by those who perform them. Guiding questions are: Who are the respective communities of practice and intermediaries; and what socio-material structures, resources, and technologies do they draw on; and what is the institutional context they are embedded in? Why are those practices marginalized and excluded from the narrative of social change and from policies of infrastructure development? What role do imageries of sustainable futures play in discourses on infrastructure?

This article presents first results from an ongoing research project that aims to put such a research design into practice for the case of electric mobility in Bangladesh. It draws on field research for a pilot study conducted in February 2022 that included field visits to about a dozen garages – the key nodes of the electric rickshaw business – in the capital city of Dhaka, a megacity of 20 million people, in Rajshahi, a medium-sized city of around 750,000 inhabitants in the west of Bangladesh, and the rural town of Singra with around 25,000 inhabitants. I conducted a mix of exploratory and in-depth interviews with garage owners, rickshaw fleet operators (maliks), rickshaw pullers, technicians (mysteries), entrepreneurs, and several staff of ME SOLshare, a climate tech startup that offers different products and digital services to operators and drivers of electric rickshaws.[1] Some of the in-depth interviews were recorded and transcribed; others were documented in written minutes.

The article furthermore builds on document analysis to complement the interviews, based on policy documents, consultancy reports, publications by international development organizations, academic studies (mostly by researchers from local universities), and newspaper articles. I conducted a keyword search for the term "rickshaw" in the online repositories of five major English-language newspapers in Bangladesh: *The Daily Star*, *The Business Standard*, *Dhaka Tribune*, *The Financial Express*, and *New Age*. Notably, this keyword covers articles on every type of three-wheeled transport in Bangladesh, including the conventional cycle rickshaws, electric rickshaws, and auto-rickshaws using fossil fuels. The search concentrated on articles

[1] Among the most productive interviews were extensive sessions with field engineers of ME SOLshare. These engineers, all of whom are Bangladeshis, had visited 70 garages all over the country for purposes of market research, interviewed the owners, and spent several days with the rickshaw drivers to achieve an in-depth understanding of their everyday operations. These interviews are therefore extensively cited and add empirical breadth to the study.

published in the last five years; older articles were included when deemed appropriate. I also used snowballing strategies – for example, conducting additional keyword searches for associated terms, using the "related articles" function in online repositories, or including referenced publications in the sample. The sample of documents was categorized according to type and was thematically clustered. I began with deductive coding of the entire sample – using codes that I had developed from the analysis of interviews – to contextualize and verify interviewees' statements. Next, I shortlisted the articles that explicitly situate electric rickshaws in wider processes of social change (e.g., opinion pieces in newspapers and reports by the government, NGOs, or development agencies) and conducted inductive coding aimed at achieving a grounded understanding of the narratives employed. These narratives were then analyzed in terms of their structure and the roles they assigned to different actors. While the results presented in this article are of an explorative nature and require further substantiation and refinement, they point to some of the blind spots in the debate on sustainability transitions in the non-West that need to be addressed in future research.[2]

3. Situating the Electric Rickshaw: Three-Wheeled Transport in Bangladesh

A visit to the city center of Rajshahi is likely to unsettle some of the stereotypes associated with Global South urbanism. During daytime, the main roads at Shaheb Bazar are as crowded with people and vehicles as they are in all market areas of South Asia. What might create a cognitive dissonance for foreign observers is the unusual mix of sensory impressions. Whereas the vehicles, almost all of them three-wheelers, feature the typical decoration for the region, including elaborate floral patterns and calligraphy, the characteristic noise created by dozens or hundreds of combustion engines running at the same time is suspiciously absent in the cacophony of sounds. At times, the street noise ebbs to a level that allows for recognizing the light whizzing of electric motors, a sound that is associated with the future of transport in global discourses on sustainable development.[3] What surprises even more is the comparatively high air quality in what was once one of the world's most polluted cities. In 2016, the British newspaper *The Guardian* celebrated Rajshahi for being the world's most successful city in reducing air pollution. As main reasons, the article cites the City Corporation's crackdown on brick

[2] A content analysis of Bangla-language media, for example, is pending.

[3] For an audio-visual impression, see https://www.youtube.com/watch?v=LFri6F2EEQc (Accessed November 21, 2022).

kilns on the edge of town, now relocated to rural periphery, and the rapid adoption of battery-powered rickshaws (*Guardian* 2016).

Is Rajshahi one of those overlooked sites of a green transition in infrastructure provision, as the international press suggests? Local newspapers along with researchers from the city's universities do not seem to subscribe to that narrative. They regularly denounce the city's 40,000 electric rickshaws for causing "unbearable traffic jam in Rajshahi" (Basri et al. 2016, 339) and road accidents (*Financial Express* 2018), echoing a similar debate revolving around their non-motorized predecessors, the cycle rickshaw. Arguably, the rejection of electric rickshaws is attributable not to them being electric but to them being rickshaws – a technology that comes with a specific historical legacy and is loaded with meaning. In his book, *The Shock of the Old*, David Edgerton (2008) cites rickshaws as a prime example of a seemingly outdated technology that remained far more significant as a technology-in-use than widely assumed.

Cycle rickshaws came to be widely used in Asia since the 1930s. Since the 1960s, they became an integral part of urban transport in Bangladesh and have remained so to date. According to unofficial and conservative estimates, there are currently more than one million cycle rickshaws in the capital city of Dhaka alone, only 28,000 of which reportedly operate with an official license, as the issuance of new licenses was stopped in 1988 (Ray 2022). Acknowledging the precarious situation of rickshaw drivers, there is wide scholarly consensus that, for better or for worse, the rickshaw remains indispensable for urban mobility in South Asia, especially for the poor and middle-class populations (Rahman and Assadekjaman 2013). In 2009, the rickshaw was the single highest passenger-carrying mode in Dhaka (JICA 2010). In their study on the travel behavior of middle-class women in Dhaka, Huq-Hussain and Habiba (2013) show that particularly for women, the convenience, safety, security, and privacy afforded by the rickshaw remain without alternative, especially in a city that features narrow alleyways, lacks effective modes of mass transit, and is recurrently referred to as "unwalkable" in public discourse (Morshed 2019; Ifti 2022). Many of these advantages also apply to motorized three-wheelers.

The motorization of rickshaws, mostly based on moped technology, dates back to the 1950s and has established itself in vehicles known as "tuk-tuk" in Thailand or "baby-taxi" in Bangladesh. The manufacture of these motor rickshaws is dominated by a few large companies – above all the company *Bajaj* from Chennai, India (Gallagher 1992, 360). The original two-stroke engine *baby-taxis* in Bangladesh were banned in 2002 in an attempt to curb air pollution. They were gradually replaced by auto-rickshaws with four-stroke engines running on compressed natural gas (CNG) or petrol. In 2018, liquefied petroleum gas (LPG) was added to the list of authorized fuels (Adhikary 2018). Currently, around 15,000 CNG auto-rickshaw drivers and around 300,000 such

vehicles are registered in the country (Mohiuddin 2021). Although they are called motor-rickshaws, they are a different kind of vehicle than the cycle rickshaws. Motor-rickshaws are based on a much sturdier frame, are manufactured on an industrial scale, and are operated in a more regulated environment. For CNG rickshaws, ownership is less concentrated than for cycle rickshaws, and more drivers own their vehicle. They usually offer longer trips for considerably higher fares than cycle rickshaws and enjoy a higher reputation among drivers. However, they are on the decline, as they face competition from ride-sharing apps (Mohiuddin 2021) and from a relatively new type of three-wheeler that has witnessed a remarkable career in the last 15 years, the electric rickshaw.

Most sources situate the beginning of electric three-wheelers in Bangladesh in the years 2007–2009, when local workshops began to equip different kinds of three-wheelers with electric motors and lead-acid gel batteries imported from India and China (Interview 1, 3; Khan 2018, 6). The experiments in electric mobility have resulted in various types of vehicles that are remarkably different in how they are based on, or break with, the specific material, cultural, and institutional legacies of three-wheeled transport in Bangladesh.

The first type is a conventional cycle rickshaw that has been retrofitted with an electric motor and four lead-acid batteries, mounted below the passenger seat, to work as an electric rickshaw (Figure 1). More recently, ready-made conversion kits imported from China have become available. These kits are more expensive but also more reliable than the conventional ways of retrofitting (Interview 6). The retrofitted rickshaw directly evolved out of the ecosystem that has long established itself around the manufacture and operation of cycle rickshaws. Much like its unmotorized counterpart, it is mainly operated in the narrow and congested alleyways of large cities, especially Dhaka, and off the main roads where rickshaws are generally banned. In this urban environment, its advantage over conventional cycle rickshaws is marginal in terms of speed and seating capacity. However, because its operation is physically less exhausting, electric rickshaws allow for longer working days and, generally, a longer working life, which makes them particularly attractive for elderly and disabled pullers (Interview 6; Zami 2022). At the same time, these rickshaws are operated only off the main roads and within the same precarious legal situation as the cycle rickshaws and require regular bribes to the traffic police (Interview 5).

The conditions are slightly better for a different version of these retrofitted rickshaws, locally called *vans*. Instead of a passenger seat, these rickshaw vans feature a flatbed for the transport of goods or use as a mobile market stall. While being almost absent in Dhaka, the electric version of the vans has a very widespread use in smaller cities and more rural areas, where it can fully leverage its advantage over its non-motorized counterparts and where regulations are poorly implemented. In these areas, flatbed vans can be seen

plying on country roads and arterial roads of smaller cities, carrying mostly agricultural loads up to a ton (including entire logs) and/or passengers over distances of a few kilometers.

Figure 1 Types of Retrofitted Cycle Rickshaws

Source: Photos by the author. Clockwise: A "conventional" retrofitted cycle rickshaw (Dhaka); A cycle rickshaw retrofitted with an integrated propulsion set (Dhaka); A retrofitted rickshaw "van" used for passenger transport (Rajshahi). A retrofitted rickshaw "van" used for goods transport (Rajshahi).

Nevertheless, it is another type of electric rickshaw that has proven most consequential in its impact on the transport sector. In local vernacular, this type is called "easybike," a term that has found entry in the official discourse (Figure 2). In contrast to the retrofitted cycle rickshaws, its original design is based on a larger, sturdier frame that is industrially manufactured for three-wheelers. Easybikes bear resemblance to the CNG-run auto-rickshaws with which they also compete in regard to speed and seating capacity. Its five lead-acid batteries, distributed to the boxes underneath the bench seats of the drivers and passengers, power an electric motor with performance ranging from 0.65 to 1.4 kW over a range of up to 100 km (Interview 3; Khan 2018). With its seating capacity of 4-8 persons and traveling speed of around 30-35 km/h, and its capacity to cope with rough roads, the easybike offers a wide scope of application.

Consequently, the easybike has quickly established itself as an attractive alternative to almost all other modes of public transport. Its profound impact on public transport can be observed just outside the boundaries of the two Dhaka city corporations, within which the general ban of easybikes is strictly enforced. In the industrial town of Tongi that borders Dhaka in the north, easybikes are in high demand among workers in the garment industry for their daily commute as a slightly more expensive but more flexible and comfortable alternative to crowded buses. Their importance for public transport increased further when bus travel was restricted because of the COVID-19 pandemic (Interview 3). Besides door-to-door trips, easybikes have taken over a substantial share of the last-mile intermediate transport to and from bus, train, or ferry stations. In Manikganj, a suburb of Dhaka, they account for most of the feeder transport to the ferries across the Jamuna river (Interview 4); for the medium-sized city of Rangpur, a survey shows easybikes to be the most widespread and popular mode of public transport (Pramanik and Rahman 2020); and in Khagrachhari, a hilly district in one of Bangladesh's tribal areas, easybikes have replaced the Mitsubishi four-wheelers that previously served the villages around the town (Interview 3).

These factors have contributed to the rapid uptake of electric rickshaws that has accelerated in the last 4-6 years. Although the "actual number of battery-operated rickshaws and vans will never be known" (Alamgir 2022), it is estimated to have increased from around 200,000 in 2016 (Rahman et al. 2016) to anything between 1 and 4 million today (Zami 2022), with most estimates putting the number around 2 million (Adhikary 2021). The remainder of this article will focus on the easybike as the most important subset of electric rickshaws.

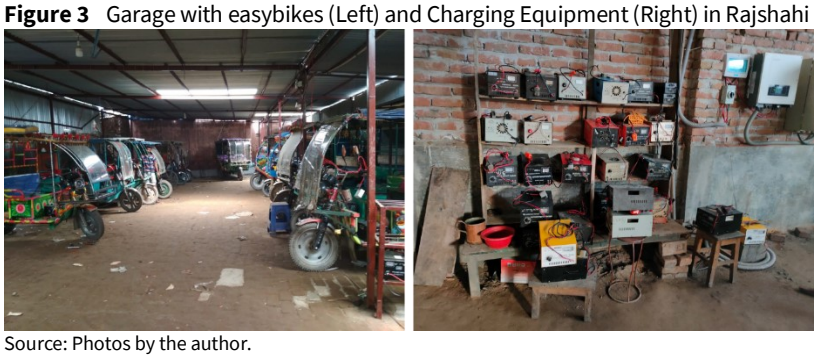
Figure 2 An Easybike (left) and a "Mishuk" (right) in the City of Rajshahi

Source: Photos by the author. Mishuks were originally developed in the mid-1980s by the Bangladesh University of Engineering and Technology as "appropriate technology" for low-cost transport using a gas engine (Gallagher 1992, 359-62). They are now being retrofitted with electric motors to work as a smaller version of the easybike.

4. Disruptive Sustainability from the "Garage"? The Commercial Success of the Electric Rickshaw

The rapid electrification of three-wheeled transport in Bangladesh is remarkable for its informal, localized, and decentralized nature. Unlike the CNG-run auto-rickshaws that are manufactured on an industrial scale outside the country and imported as whole, the easybike is a domestic creation. An estimated 95% of electric rickshaws in the country today are locally manufactured (Haque 2022) by thousands of small "unorganized players" (Philip 2019) operating in garages (Figure 3). Garages are a key node within a community of practice that has evolved around the electrification of three-wheeled transport and includes, amongst others, customers, drivers, municipal authorities, electric utilities, technicians, and traders. They stand out for integrating a broad variety of practices that cover a large part of the vehicles' life cycle.

Figure 3 Garage with easybikes (Left) and Charging Equipment (Right) in Rajshahi



Source: Photos by the author.

First, garages are the primary (albeit not exclusive) site for the assembly and repair of electric rickshaws and, in some cases, the manufacture of individual parts. A garage in Tongi that had evolved out of a welding shop, for example, began welding its own frames that imitate the design of the imported frames from China but cost considerably less (Interview 3). The second key function of garages is the storage of vehicles during the time when they are not in use. In both urban and rural areas, those rickshaw pullers who own their vehicles cannot store them at their premise owing to the lack of space and/or the fear of theft (Interview 4, Khan 2018, 22). The same applies to many of the *maliks* who operate fleets of vehicles (Interview 4). Garages thus offer to store the vehicles overnight for a fee. As an increasing number of garage owners are operating their own fleets, the boundaries between *maliks* and garage owner are becoming increasingly fluid. In the case of electric rickshaws, the storage

is combined with a third function, the charging of the vehicles. In the case of externally owned vehicles, this is also done for a fee (Interview 3).

Setting up and operating a garage requires a wide set of skills and uncodified know-how that are typical for entrepreneurship in a (largely) informal economy. For "doing infrastructure," garage owners have to navigate a diverse and unregulated field of activity at the intersection between the hitherto unrelated transport and electric utility sectors. Setting up a garage requires both a substantial amount of capital for local standards, usually in the higher thousands or lower tens of thousands of USD, and considerable know-how. Whereas some garages evolved out of the wider ecosystem around this transport (welding shops, spare part shops, etc.), many of the maliks and garage owners are newcomers to the transport business (Interview 1, 3). Typical profiles are migrant workers (e.g., to the United Arab Emirates) investing their savings into what is generally considered to be a lucrative business (Interview 4) but now seems to be heading toward market saturation in several areas (Interview 10). Many garages have evolved out of partnerships between incumbents and newcomers that are often related through kinship ties.

In a market environment in which investment capital is scarce and distributed, garages capitalize an advantage of electric rickshaws that most analyses tend to overlook – namely, their ability of incorporating a wide range of established technologies in their design. The electric rickshaws of Bangladesh are largely based on an ensemble of technical components that are widely framed as outdated and inefficient. The use of lead-acid batteries is a case in point. Lead-acid batteries are often criticized for their low capacity, long charging times, and the potential health and environmental hazards connected to their disposal. However, garages benefit from a procurement and service infrastructure relying on an established domestic industry for the manufacture of lead-acid batteries that has received a boost by the proliferation of solar home systems between 2000 and 2020. Today, electric rickshaws account for 60-70% of the demand for lead-acid batteries, although this demand is largely served by Chinese-owned factories located in Bangladesh (Haque 2021). Moreover, operators of electric rickshaws profit from an unregulated but effective recycling infrastructure that enables them to return batteries after six months of use for about half the price (Alamgir 2022). According to an article in *The Daily Star*, 97% of lead-acid batteries in Bangladesh are manufactured through the recycling of batteries and scrap metal in an estimated 1,100 informal and illegal workshops (Rahman 2021).[4] At the same time, Bangladesh hosts neither a domestic manufacturing nor an established recycling system for lithium-ion batteries, which fuel electric mobility in Europe and the US.

[4] The authors most likely refer to recycled batteries.

Besides its resource efficiency, the commercial success of the electric rickshaw also needs to be understood in terms of the general energy efficiency advantage of three-wheelers over cars. Studies on light electric vehicles (LEVs) in the context of Germany have shown that a four-wheel LEV that weighs around 500 kg consumes 30-80% less electricity than a battery-operated electric car (Brost et al. 2022). With a weight of around 200-300 kg, the electric rickshaws of Bangladesh can be safely assumed to be even more energy efficient than four-wheel LEVs. Tellingly, precise figures for electric rickshaws do not exist. Despite being functionally very similar to cargo bikes and microcars, electric rickshaws have not found entry in respective studies that otherwise cover a wider range of LEVs. To the contrary, technical analyses of electric rickshaws – for example, by local consultants – emphasize the outdated and inefficient nature of its individual components or selected aspects such as their poor dynamic stability and aerodynamic efficiency (Zami 2022).

Notably, the electric rickshaw comes closer to a "disruptive innovation" than a Tesla, for example – at least if one uses the term in the original specific and concrete definition by Clayton Christensen:

> An innovation that is disruptive allows a whole new population of consumers at the bottom of a market access to a product or service that was historically only accessible to consumers with a lot of money or a lot of skill. (Bower and Christensen 1995)

In Europe and the US, all major entrants to the electric vehicle (EV) market started out by developing cars for sale to high-end buyers with the hope of eventually moving downmarket (Roose 2014). The commercial success of the electric rickshaws of Bangladesh has followed the reverse logic. As a report by the United Nations Environment Programme states, the "small size and electrical power system of 2- and 3-wheelers makes them exceptionally efficient [...], providing inexpensive mobility for people at the lower economic levels" (UNEP 2020, 9). Comprehensive "total cost of ownership" analyses for India (WRI 2020) and similar unpublished studies on Bangladesh (Takeno 2020, 24) show that electric rickshaws also enjoy a steadily growing cost advantage over their industrially manufactured counterparts powered by CNG, petrol, and diesel. However, electric rickshaws have proven to be disruptive not only on the economic but also on a political level.

5. Dealing with the Electric Rickshaw: The Political Economy of Three-Wheeled Transport

In 2017, the Rajshahi City Corporation (RCC) resumed issuing trade licenses for battery rickshaws, notably as non-mechanical vehicles. It also issued

licenses for the drivers. The decision followed a back and forth between the RCC and the union of rickshaw drivers. In December 2016, the RCC had imposed a ban on battery rickshaws that had caused several fatal accidents on the roads of the city. However, after vehement protests and political lobbying by rickshaw owners, the RCC rushed to lift the ban in 2017 but set a number of conditions: battery rickshaws should use motorcycle wheels instead of rickshaw wheels, equip all wheels with breaks, and limit their speed to below 30 km/h (*New Age* 2017). This decision, in turn, led to a novel conflict between government authorities on the municipal and national level. The Bangladesh Road Transport Authority (BRTA) reprimanded the RCC, arguing that because battery rickshaws were mechanical vehicles, much like the CNG-run auto-rickshaws, they could only be licensed by the BRTA (*Financial Express* 2018). Ultimately, the intervention was of little avail. To date, battery rickshaws continue to ply on the roads of Rajshahi with licenses issued by the RCC (Figure 4). The extent and terms of their operation remain to be negotiated on the municipal level, with every attempt by the RCC to impose restrictions causing a heavy backlash by the unions of rickshaw drivers (*Daily Star* 2021).

As the case of Rajshahi shows, electric rickshaws are deeply enmeshed in a number of conflicts and negotiations across different levels of political administration. On the national level, the BRTA considers electric rickshaws as mechanical vehicles that are allowed for registration since 2020 but only in theory. The BRTA has not issued any registration, route permit, or fitness certificates for these vehicles because their "designs were defective and would not meet requirements," as the authority's director of road safety quotes (Zami 2022). Instead, the government has repeatedly attempted to ban the existing, unregistered electric rickshaws from the roads. In June 2021, a government taskforce issued a nation-wide ban of electric rickshaws, a decision that caused public outcry and street protests by different unions of rickshaw drivers in Dhaka (*New Age* 2021).

The question of the legality of electric rickshaws is also answered differently on different levels of the country's judicial hierarchy. In December 2021, the country witnessed a replay of the conflict. This time, the High Court issued the ban. The government sent a strong message that it would now take the gloves off when enforcing the ban – for example, by organizing the public bulldozing of electric rickshaws, covered by national news media (Alamgir 2022). In April 2022, the High Court's decision was overturned by the Bangladesh Supreme Court (Zami 2022), but the legal uncertainties around the operation of electric rickshaws remain.

However, even before its temporary suspension, the deal was only enforced in Dhaka. In the capital city, a powerful coalition against three-wheeled transport has created "a relatively stable, cross-sectoral, informal and productive 'urban regime' for motor-cars" (Hasan and Dávila 2018, 253). Owing

to a lack of coherent organization, both customers and drivers of rickshaw services stand little chance of putting through their interests against this coalition that includes both global and local actors. Outside the capital city, electric rickshaws enjoy the patronage of local government bodies such as city corporations and rural councils, for whom the issuing of driver's licenses and trade licenses to drivers of electric rickshaws has become a welcome source of income (Haque 2022). Often, the rickshaw business is closely intertwined with policy-making on the district level. In the rural town of Singra, for example, the leader of a union of rickshaw drivers and *maliks* also served as one of the elected councilors (Interview 8).

Other government institutions are equally ready to condone the street illegality of electric rickshaws. The state-owned electric utility companies classify electric rickshaws (primarily the easybikes) as *electric* vehicles (EVs) and offer a specific EV charging tariff to those garages that register with them (Interview 3). However, because the registration requires the installation of expensive three-phase meters, most garages, especially in rural areas, remain unregistered and use the domestic tariff; electricity theft remains common among them (Interview 11). At the same time, different electric utility companies, such as the Bangladesh Rural Electrification Board and the Bangladesh Infrastructure Development Company, have set up a total of 14 solar-powered EV charging stations as lighthouse projects (SREDA 2022).

The "bizarre mix of barriers and promotions at the same time" (Haque 2022) might be pronounced in its incoherence but is generally not untypical for a country in which the relationship between business and politics is "very much based on deals made outside formal rules" (Raihan and Bourguignon 2020, 11). In fact, the ability to reach elite political settlements irrespective of formal rules has been cited in political economy analyses as the major explanation for the "Bangladesh paradox." This term captures the surprise in the global development community that in Bangladesh, a "steady and reasonably high rate of growth took place in the context of 'bad' or 'weak' governance" (Hassan and Raihan 2018). For better or for worse, deals between individual, elite-level actors are ubiquitous for the country's economic functioning, and considerable research has gone into analyzing Bangladesh's deals environment (Raihan and Bourguignon 2020).

Although such a deals environment is notoriously opaque, anecdotal evidence suggests that the decentralized and localized nature of the electric rickshaw business makes it particularly unsuited for elite-level deal-making. The writ petition that led to the High Court ban in 2021 was filed by the president of a company selling electric three-wheelers. Notably, the company sells the type of legal three-wheelers using the more expensive lithium-ion batteries, which have so far proven uncompetitive in the market. Commentators in the English-language press hence speculated that a coalition of actors was trying to use the ban to monopolize the market. Ultimately, the company that had

filed the writ petition had not even established its own manufacturing capacities to produce electric rickshaws with lithium-ion batteries (Haque 2022). Another indication of the uneven level of representation of interests in the deals environment is the fact that the ban of electric rickshaws was enforced not among the importers, who tend to enjoy a certain level of political patronage on the national level, but on the level of the drivers, whose vehicles were confiscated (Chowdhury 2022).

Figure 4 Prohibition Sign for Rickshaws in Dhaka (Left); Vehicle Ownership Card (Center) and Driver Card (Right) of an Electric Rickshaw Driver in Rajshahi, Issued By the City Corporation

Source: Photos by the author.

6. Sustainability's "Other": Electric Rickshaws in (Eco-) Modernist Narratives of Social Change

Why are some acts recognized as innovation and others not? In her recent ethnography of entrepreneurial citizenship in modern India, Lilly Irani (2019) engages with the politics of categorization and practices of *othering* in the discourse on innovation. Irani shows how long-standing hierarchies and systems of meaning, including those inherited from colonialism, influence the answer to the question, "who becomes an innovator and who becomes the innovator's other? [...] Who modernizes whom, and toward what horizon?" (Irani 2019, 3). Urban transport in South and South-East Asia is a prime example of this politics of categorization. In a critical comment, *WIRED* magazine recently asked why ride-sharing platforms are cast as "innovative disruption" while two- and three-wheelers that provide similar services are framed as dangerous or chaotic (Qadri 2022).

To understand this mechanism of othering in modernist discourses on societal change in Bangladesh, a recent article in *The Business Standard* is used here as an illustrative example. The article is a comment on the enforcement of the electric rickshaw ban in Dhaka's northern suburbs, which have become the recent arenas for the conflicts surrounding these vehicles. The article lauds this ban for turning the highway between northern Dhaka and the city of Gazipur from a "traffic horror" into an "easy ride" (Chowdhury 2022). Tellingly, the article opens with the account of a ridesharing car driver expressing his astonishment that the trip has taken him only a third of the usual time. The route leads through the earlier mentioned suburb of Tongi, where, according to the article, the police regularly seize "such unsafe three-wheelers" and dump them at a corner on the Bazar Road. The article cites several representatives from the local garment and mobile phone industry in support of the ban's enforcement, one of them with the remarkable quote that "[i]t proves police too can be change-makers if they are sincere in their work." Under the subheading "time is money," the article presents some figures on how much money the factories save through the improved traffic flow.

The article reverberates a narrative that recurs throughout almost all analyzed articles that situate (electric) rickshaws within wider processes of social change in Bangladesh. These main protagonists of societal and economic development in these narratives are the country's export-oriented industries, most notably the ready-made garments industry, along with the emerging electronics industry and digital service sector. Regarding the sites of economic growth, the focus is currently shifting to the second-tier cities, especially the suburbs of Dhaka (*Business Standard* 2022). The Bangladeshi government, along with international donors, has adopted an agenda for developing these second-tier cities into industrial powerhouses without repeating the mistakes of the congested metropolises in terms of infrastructure development (World Bank 2022). This agenda implies a major improvement in transport connectivity. In this narrative, electric rickshaws are standing – quite literally – in the way of economic modernization. The role assigned to the government as "change maker" is to protect the formal economy from the negative externalities of the informal economy – for example, through enforcing rules that marginalize existing (electric) rickshaws. Although variations exist, this is the narrative that dominates public discourse.

The framing of electric rickshaws as "unruly" vehicles is reinforced by newspaper reporting on a daily basis. A majority of articles concerning electric rickshaws covers their involvement in fatal road accidents or incidences of violence. In many articles, electric rickshaws are used in combination with the attribute "illegal" (e.g., *Dhaka Tribune* 2022b). Another large share of newspaper reporting covers protests of rickshaw unions against the bans or more subtle acts of resistance such as the vandalizing of police boxes (*Dhaka Tribune 2022c*).

This does not mean that other interpretations are absent. The stigmatization of rickshaws itself is a topic that has been taken up by several authors (*Financial Express* 2022a; Haque 2022). "Rickshaw art" is a popular genre of Bangladeshi folk arts and crafts, and the exhibitions, movies, or books that take up this topic receive broad media coverage (e.g., *Daily Star* 2022). Opinion pieces or letters to the editors point to the social impacts of rickshaw bans and the lack of alternatives in public transport (*Financial Express* 2022b). A few commentators even highlight the unappreciated potential of electric rickshaws to become Bangladesh's "green mobility solution of the future" (Rahman 2020), albeit under the condition of addressing the safety concerns – the decarbonization of charging (e.g., by setting up solar charging stations) and a transition to lithium-ion batteries (Zami 2022). However, although these comments propose imageries of sustainable futures in transport that differ from those in the official discourse, they do not challenge the premise of the unruliness and unsustainability of the *current* fleet of electric rickshaws.

Such narratives are readily picked up by elite-level actors that pursue vested interests. The company behind the above-mentioned writ petition that lead to the High Court ban explicitly refers to "other three-wheelers in the market to be harmful for the environment," as they use lead-acid batteries (Haque 2022), use substandard materials, and are inefficient (Zami 2022). Similar strategies of "othering" electric rickshaws are employed by the government in its current and hitherto unsuccessful attempts to promote an electric mobility transition on its own terms that imply a much higher reliance on electric *automobility* and on the domestic, large-scale industrial manufacturing of EVs.

In 2019, the BRTA began developing a draft policy to expedite the import, domestic manufacturing, and registration of EVs. The development of the policy then stalled for almost two years, creating frustration among companies that were planning to set up plants for the manufacture of EVs in the country (Chakma and Adhikary 2021; Adhikary 2021; Mamun 2022). When the draft of the new guideline was finally published in 2021, it became clear that it would not apply to electric rickshaws. These "battery-run vehicles do not come under the definition of electric vehicle as they are not technically sound," the BRTA chairman was cited. They could only be included "after some customisation and remodelling" (Akhter 2021). The policy provides a stark example of urban "luxury ecologies" (Cohen 2017; Greenberg 2019) that grossly misrepresent the social realities on the ground. In contrast to the 1-4 million electric three-wheelers, a market for electric cars is "virtually nonexistent in Bangladesh," as a report by a consultancy company suggested in June 2021 (LightCastle Partners 2021). "Currently," the report states, "it is estimated that there are less than 10 passenger EVs in the country, and all of them are concentrated in the capital city" (LightCastle Partners 2021).

This policy also limits the framework of intervention for self-recognized change agents such as NGOs, consultants, government-initiated agencies, and social enterprises. Existing projects by international development agencies, for example, have to walk a thin line and frame their activities in a way that commits to the official agenda of promoting electromobility without openly supporting the "unruly" electric rickshaws that are already on the street. In an instance observed during field research, a corporate social responsibility project for setting up a solar charging station for electric rickshaws was renamed to the cryptic title "Smart Renewable Energy Pilot Project" for this reason. By and large, intervention by international agencies is limited to financing studies and pilot projects with imported, street-legal vehicles (e.g., GIZ Akzente 2021), whose competitiveness in local markets remains to be proven and which have found to be difficult to scale up or transfer in the past (see, e.g., Namba 2021).

More importantly, the lack of effective policies has turned the very narrative that is currently used against electric rickshaws into a self-fulfilling prophecy. What is sustainable on the small scale becomes unsustainable on the large scale (on local scale revolutionary infrastructures, see also Boyer 2022, in this volume). In many places, electric rickshaws have become victims of their own success. In the absence of policies that effectively integrate them with the public transportation systems, electric rickshaws have replaced transport modes that require much less road space per passenger – most notably, busses. Without the enforcement of regulations to ensure their road safety, electric rickshaws have in fact become a regular cause of road accidents (although it remains to be proven if their involvement in accidents is statistically higher than for other vehicle types).

Although they contribute to the improvement of urban air quality, electric rickshaws shift CO_2 emissions to the power sector that is highly reliant on fossil fuels in Bangladesh. The country ranks in the top five for global coal and gas power projects in development (by megawatt) (Global Energy Monitor 2022) and is criticized by environmental watchdog organizations for being "one of the last dumping grounds for polluting power" (Market Forces 2022, 2). Moreover, the high number of electric rickshaws charging at the same time puts enormous pressure on the country's electricity infrastructure. In the summer of 2022, a sharp increase in gas prices plunged the country into an energy crisis that led the government to resort to austerity measures to save electricity. During this period, there was an outcry in Bangladeshi media that the "illegal" electric rickshaws continue to operate amid massive power cuts (*Dhaka Tribune* 2022a).

Finally, the sheer number of electric rickshaws has led to the fact that any government intervention comes with massive social implications for millions of families. However, these implications too are a matter of framing. The article on the rickshaw ban in Gazipur, that was discussed in the beginning of

this chapter, ends with an exemplary account of the misery faced by the families of 6,000 drivers whose vehicles have been confiscated. The subheading for the last section, once again, is revealing: "Discipline has a cost" (Chowdhury 2022).

7. Concluding Discussion

In a special issue introduction from 2013 that otherwise painted a rather bleak picture of the cycle rickshaw as a marginalized form of transport, William Steele still ended on a positive note. After all, the rickshaw could open up trajectories to a sustainability future in transport:

> [It] may well be the green vehicle of the future, and not just in South Asia. Vilotaxis (*sic*), electric-assisted and solar-powered pedicabs, and other new-generation rickshaws are claiming space in cities throughout Europe and North America and belatedly Asia. (Steele 2013, 59)

A reassessment of this prediction roughly a decade later does not come without ironies. Worldwide, electric two- and three-wheelers are estimated to displace more than one million barrels of oil per day, five times the amount of oil displaced by electric passenger cars (BloombergNEF 2022). In South Asia, electric propulsion has renewed the commercial success of three-wheeled transport – but not everywhere as a "green vehicle of the future." This article has explored the reasons for this discrepancy.

This study has shown that the commercial success of the electric rickshaw has been achieved through practices of *doing* infrastructure that make efficient use of energy and material resources, as they draw for example on processes of reuse, rearranging, and recycling. These practices are performed by communities of actors, most notably that of garage owners, maliks, and drivers, who act as de-facto intermediaries that connect actors, knowledge, and resources across a variety of fields, including the transport, electric utility, and electrotechnical sectors, as well as across the fluid boundaries of the informal and formal economy. These practices are seldom, if at all, informed by imageries of sustainability. Instead, they can be explained by the fact that they are highly competitive in a largely unregulated market environment characterized by a scarcity of material resources and financial capital but by a relatively high availability of low-paid labor. As they are firmly embedded in existing socio-material structures, battery-powered three-wheeled transport remains decentrally organized and distributes economic benefits relatively broadly among small entrepreneurs (drivers, maliks, garage owners) at the local level. For the same reason, it is difficult to regulate at the national level, difficult to monopolize, and difficult to govern through elite-level deals.

On the level of political economy, electric rickshaws are caught between local patronization and national-level bans, between policies to advance electric mobility and those aimed at removing electric rickshaws in their present material configuration from the streets. The study has furthermore scrutinized the narratives that different actors draw on in the ensuing conflicts. As was shown, national-level policy-makers and business elites in Bangladesh (like in many other aspiring economies in the Global South) use imageries of sustainability in a rather selective and instrumental way, blending them into a normative concept of (eco-)modernism, often in the form of luxury ecology. Not seldomly, they mobilize sustainability narratives against electric rickshaws and employ more or less deliberate strategies of "othering" them in imageries of sustainable infrastructure futures. This mechanism of "othering" has shown to be self-perpetuating, as it (re)produces the conditions from which it draws its legitimation.

Nevertheless, these narrow and exclusive conceptions of sustainability prove to be highly compatible with grand, technology-centric sustainability narratives in global debates. They connect, for example, with global discourses on electromobility centered on automobilism and, if they focus on two- and three-wheeled transport, display little sensitivity for the "historical, social, economic and geographical situatedness of informal transport practices" (Wood, Kębłowski, and Tuvikene 2020, 3).

Decolonizing epistemology of research in the South requires critically revisiting grand sustainability narratives (through technologies developed in the North) and focus on citizens' empowerment and well-being (Ghosh and Arora 2022). At the same time, this case study shows the tightrope that the proponents of the decolonization agenda have to walk to make alternative ontologies visible in a way that empowers subaltern actors without reproducing mechanisms of "othering" them in the discourse on infrastructural futures. The case study sounds a note of caution concerning a tendency of romanticizing technological bricolage, improvisation, and hybridity in the current academic research on infrastructure in the Global South. For example, emphasizing the ad hoc character of informal arrangements for accessing infrastructure services carries the risk of de-historizing and de-localizing them and ignoring the fact that they are deeply embedded in site-specific and historically grown socio-material structures. By touting informal material practices as alternatives to technocentric and supposedly apolitical neoclassical approaches to infrastructure provision (Wood, Kębłowski, and Tuvikene 2020), there is a risk of falsely situating these practices outside the realm of economic efficiency, rationality, and utility. By focusing on the epistemological level, there is a risk of missing out the key questions of power and deep structural inequalities that shape the social and institutional realities of socio-technical transitions.

To empower the associated communities of practice, localized practices of sustainable infrastructure provision need to be not only understood "on their own terms" but also translated back into the categories employed by planners, policy-makers, and the international development agencies. It seems well possible to conceive of a sustainable future of transport in Bangladesh that synergistically connects a frugal, bottom-up innovation such as the electric rickshaw with a highly sophisticated, technocratic, and imported solution such as the mass rapid transit system currently under construction in Dhaka. To achieve this scenario, it seems less expedient to formulate grand counter-narratives to those grand narratives that dominate the global discourse on sustainable infrastructure futures but to aim toward more integrative, nuanced, site-specific, and historically informed narratives and mobilize political support for them.

The electrification of three-wheeled transport in Bangladesh offers valuable lessons for the debate on electric mobility transitions in the Global North. It invites to critically reflect on central concepts, such as innovation and efficiency, and their selective application in the debate on electric mobility. For this debate, which is criticized for its automobile bias (Behrendt 2018), it showcases the potential of conceiving mobility beyond the car. In particular, the example of neighboring India illustrated how electric three-wheelers can be effectively combined with mass transit. Nevertheless, the project of "rebalancing the electromobility debate" remains in its infancy (Sustainable Mobility for All 2021). Interestingly, the global debate on "micromobility," which has recently emerged not least as a reaction to the automobile bias in transport studies, has remained largely ignorant of long-established practices of three-wheeled transport in the Global South (Mitullah et al. 2019). Electric rickshaws are typically excluded from its definition of "micromobility" (O'Hern and Estgfaeller 2020).

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Appendix

Table 1 List of Interviews Cited in the Text

Code	Interviewee	Place	Date
Interview 1	Head of Operations at climate tech company	Dhaka, Joar Shahara	2/13/2022
Interview 2	Garage owner and rickshaw fleet owner (malik)	Dhaka, Karail	2/13/2022
Interview 3	Field engineer at climate tech company	Dhaka, Joar Shahara	2/14/2022
Interview 4	Field engineer at climate tech company	Dhaka, Joar Shahara	2/15/2022
Interview 5	Garage owner and rickshaw fleet owner (malik)	Dhaka, Joar Shahara	2/16/2022
Interview 6	Electric rickshaw driver	Dhaka, Joar Shahara	2/16/2022
Interview 7	Garage owner and rickshaw fleet owner (malik)	Rajshahi	2/17/2022
Interview 8	Garage owner and rickshaw fleet owner (malik)	Singra	2/18/2022
Interview 9	Street mechanic (mystery)	Dhaka, Old City	2/19/2022
Interview 10	Chief Business Officer EV manufacturing company	Dhaka, Banani	2/20/2022
Interview 11	Managing Director at climate tech company	Dhaka, Banani DOHS	2/12/2022

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